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ZOOLOGY.

A posthumous paper on Myxosporidia by M. Prosper Thélohan has recently appeared prefaced with a short account of the author's scientific career by E. G. Balbiani. The Memoir, intended as a thesis for the degree of Doctor of Science, while complete in the essential parts, lacks the final chapter in which the author intended to indicate the relations of the different genera and families of the Myxosporidies.

Briefly stated, Myxosporida are parasitic Sporozoa found living in certain fishes, batrachians and reptiles. They have also been observed living in various arthropods, notably spiders and crustaceans. Certain families are limited to vertebrates host: Myxobolidae and Chloromyxidae. It is to the latter forms that the author devotes his paper.

It has long been known that the Myxosporida of the vertebrates assume two forms; one, a small ameboid body swimming free in the liquid which contained in certain organs, chiefly the gall and urinary bladders, and a second form which is found distributed in compact tissues, like the connective tissues and the muscles. In either case they may be harmless to the host, or on the other hand, give rise to grave disorders, resulting in the death of the animal which they have invaded.

The free swimming species are variable in form, the most common one being that of an elongated cone the base of which corresponds to the anterior extremity; others are almost spherical. It is, however, difficult to decide upon a definite species form, since each individual exhibits such extraordinary polymorphism. The organisms found in the tissues are generally spherical.

Ordinarily these parasites are colorless, but yellow ones have been seen, and a few green ones are reported.

In dimensions, as in form, there is great diversity. The free swimming species are from 10 or 12 μ . in diameter to 5 mm. in diameter.

Reproduction is accomplished by sporulation, and, probably, also by fission. The protoplasmic body of the Myxosporida is plainly differentiated into a peripheral zone, *ectoplasm*, surrounding the central sarcode, *endoplasm*. The former functions as a protection for the latter and, also is capable of putting out pseudopodia which act as organs of locomotion or fixation. These pseudopodia are localized in certain species, in others they appear at random. They take no part in the phenomena of nutrition.

The endoplasm of young individuals appears homogeneous, but in older ones there are found, in some cases, certain products of differentia-

tion, among which the author distinguished, fatty globular masses and rhombohedral crystals of hæmatoidin. In others, there are vacuoles, containing protoplasmic matter which differs from the rest of the endoplasm. It is in the endoplasm also that the nuclear elements are found, often in great number, around which the spores develop. The author traces the development of these spores, describing minutely the various stages of growth. Upon arriving at maturity they remain enclosed in the endoplasm for a varying length of time. When set free it seems to be connected with the destruction of the protoplasm which persists in the mother organism after the formation of the spores. The free-swimming species are expelled from the host either with the fæces or the urine, but the ones imprisoned in the tissues continue where they are until set free by the death and subsequent decay of the tissues of the host. The spores rarely germinate in the old host, never in any exterior medium, but stay dormant until chance provides them a new host.

As to the food habits of the Myxosporida, M. Thélohan observations are to the effect that they imbibe nourishment from the fluids in which they live. In no case did he see food particles ingested.

The following classification of the Myxosporida was proposed by the author in 1892, and his subsequent researches confirms the distinguishing characters.

Spores {	form variable {	no vacuoles in the plasma.	{ 2 capsules. I. Myxidiidæ. 4 capsules. II. Chloromyxidæ.
		1 vacuole which colors a reddish brown by iodine.	III. Myxobolidæ.
	pyriform, a single polar capsule, not easily seen, with a pointed extremity; a clear vacuole, not colorable with iodine, at the larger end.		IV. Glugeidæ.

Myxidiidæ contains 6 genera with 25 species; Chloromyxidæ has 1 genus, 6 species; Myxobolidæ 2 genera, 14 species; Glugeidæ 3 genera, 16 species.

The Segmentation of the Hexapod Body.—In a recent paper¹ giving the results of work upon the early stages of certain of the Orthoptera, Dr. Heymons gives the whole number of segments in the Hexapod body as twenty-one, of which six form the head; three, the

¹ Anhang. Abh. K. preuss. Akad. Wiss., Berlin, 1895.

thorax ; and twelve, the abdomen. At some time during the development of the insect, appendages are present upon all except the first, third and twenty-first segments. The frons, clypeus, labrum and compound eyes are parts of the first segment. The second segment bears the antennæ, the fourth the mandibles, and the fifth and sixth the two pairs of maxillæ. The hypopharynx does not belong in the series of appendages but is formed by a folding of the ventral portions of the fourth, fifth and sixth segments. The cerci, contrary to the views of some authors, are the true appendages of the twentieth (eleventh abdominal) segment. Considerable emphasis is laid upon the similarity between the first and twenty-first segments, in their relations to the openings of the alimentary canal, in being free from appendages, in the lateral position of their ganglia and in the relative changes of the appendages of the adjoining segment. Concerning the position of the genital openings, Heymons reiterates his former opinion that they may belong primitively to the tenth segment, their position in the ninth being a secondary development.—G. M. WINSLOW.

The Coxal Glands of *Thelyphonus caudatus*.—In a brief note in the *Zoologischer Anzeiger*,² Dr. Theo. Adensamer adds a few facts to complete Sturany's work on the Arachnoidea. The two glands occur between the gastric cœca and the muscles, and extend as unbranched and unlobed sacs to the abdomen. From the anterior end of each extends a simple duct to the coxæ of the first pair of legs through which they open. A thin chitinous intima was distinguished in the ducts. An histologically differentiated portion of the gland corresponding to Lankester's medullary substance and Sturany's Marksubstanz was not found.

The following table shows the location of the openings of the glands in the several groups :

Limulus, openings in the 5th appendages.

Scorpio, openings in the 3d pair of legs = 6th appendages.

Pseudoscorpionidea, openings in the ? = ?

Thelyphonus, openings in the 1st pair of legs = 3d appendages.

Araneida :

a. Tetrapneumous, openings in the 3d pair of legs = 5th appendages.

b. Dipneumous, openings in the 1st pair of legs = 3d appendages.

Phalangida, openings in the 3d pair of legs = 5th appendages.

Acarina, openings in the ? pair of legs = ?

—F. C. K.

² XVIII, p. 424.

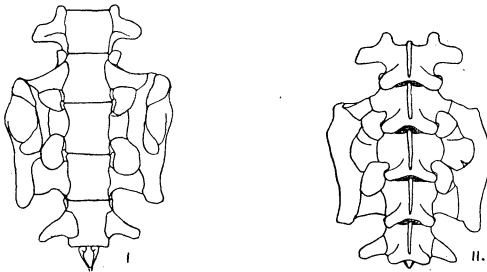
Cross Fertilization and Sexual Rights and Lefts Among Vertebrates.—The November number of this journal, page 1012, under the title "Sexual Rights and Lefts," called attention to sexual peculiarities I had recently discovered in certain Cyprinodonts. At that time no satisfactory explanation of the purpose or origin of the strange conditions offered itself. At present I would like to note in these pages what upon further consideration appears to me the best solution of the problem. Additional study has satisfied me that the sexual conditions in the genus *Anableps* prevent close "inbreeding," or, in other words, they secure cross fertilization. What in certain plants is attained by means of short stamens with the long ones is in these fishes realized by sinistral and dextral males and females. This is a view in the case of *Anableps* that brings us in face of probable benefit from the novel features, and of the possible causes of their evolution. As bearing on the inception of the dextral and the sinistral peculiarities we must consider the habit possessed by so many of these fishes of swimming in pairs, side by side, a habit that induced Professor Agassiz to name one of the genera *Zygonectes*, that is yoke swimmers. The acquisition of more or less of a dextral or of a sinistral tendency would not be at all unnatural in each of a pair habitually swimming side by side in the same relative positions to one another. It may be that cross fertilization will afford an explanation of conditions somewhat similar among molluscs.

While writing of matters concerning the publication "The Cyprinodonts," it should be mentioned, as kindly pointed out to me by Dr. A. Smith Woodward of the British Museum, that the name of one of the new genera, *Glaridodon*, was recently preoccupied among fossils, and it may be well here to discard that name (p. 40) for the term *Glaridichthys*.—S. GARMAN, Cambridge, Mass.

Abnormal Sacrum in an Alligator.—Among a lot of young alligators procured from New Orleans for the University of Chicago one in which the skeleton was prepared, showed a very peculiar variation in the pelvic region there being three instead of two sacral vertebrae.

There are as usual 24 presacral vertebrae. The 25th has the sacral ribs inclined backwards and becoming slender. The 26th has strong thick ribs, and the 27th, the first caudal in normal specimens, has also well developed ribs articulating strongly with the ilium. The 27th is seemingly biconvex. The first chevron is attached between the 28th and 29th and is, therefore, in the normal position as regards the serial number of the vertebrae, but is attached to the first vertebrae the last sacral instead of the second. The whole pelvis has migrated backwards one

vertebræ, the first true sacral tending to become a lumbar and the first caudal has become a sacral. The two side are strikingly symmetrical. The figures giving views from above and below are natural size and include the 24th-28th vertebræ.



The other known cases of variation in the sacrum of Crocodilia are, as far as I am aware, as follows: Rheinhardt¹ examined 11 specimens and found 3 abnormal.

1. *Alligator sclerops* Schn.: Last lumbar become a sacral; 23 pre-sacral.

2. *Crocodylus acutus*: 3 sacral, 3 plane-convex, 1st caudal concave-convex and bearing a chevron, thus the first caudal has become a sacral, 23 presacral.

3. *Crocodylus acutus*: First caudal has become a sacral, 24 pre-sacral.

Baur² reported two cases.

1. *Gavialis gangeticus*: 25 presacral. One intercalated between the 9th and 10th.

2. *Alligator mississippiensis*: Last lumbar become a sacral, showing on one side a small sacral rib and which does not reach ilium, 23 pre-sacral.

Baur³ reported three cases.

1. *Crocodylus acutus*: A specimen in the museum at Cambridge, Eng. shows on the right side of the 25th vertebra a strong and separate rib, on the left side the rib is smaller and coössified with the centrum. The 26 shows typical sacral ribs. The 27th shows on the left side a

¹ (Anomalier i Krydsvirvlerne hos Krokodelerne, Copenhagen, 1873, and Sur les anomalies des vertèbres sacrées chez les crocodiliens. Jul. de Zoologie T. III, No. 4. Paris, 1874.)

² Zoologischer Anzeiger, IX Jahrg., No. 238, 1886. Osteolog. Not. über Reptilen.

³ (Zoolog. Anz. XII, Jahrg., No. 306, 1889. Revision meiner Mittheilungen in Zoologischer Anzeiger, mit Nachträgen.)

strong free rib and on the right side a weaker rib but free. The 28th biconvex.

2. *Crocodylus acutus*: Two specimens in the Royal museum at Leiden have only 23 presacrales.—E. C. CASE.

The Polar Hares of Eastern North America, with Descriptions of New Forms.—In 1819 Captain John Ross, in the fourth Appendix of the second (octavo) edition of his "Voyage of Discovery" in Baffin's Bay, described a hare which he procured in Baffin Land, in latitude $73^{\circ} 37'$.

To this animal he gave the name "*Lepus arcticus* Leach," stating at the end of his description that "Dr. Leach thinks it to be very distinct from the common White Hare of Scotland (*Lepus albus* Brisson) and equally so from the *Lepus variabilis*, Pallas." Ross then makes a reference to "Appendix No. V," of the same volume, which he evidently supposed would contain Leach's description of the same animal. Leach's chapter on the "New Species of Animals" obtained by Ross, however, does not come in appendix number five but is part of the same appendix in which Ross' description appears. It is on page 170, while Ross' description is on page 151. Leach evidently described the same specimen which Ross had in hand, but gave it the name *Lepus glacialis*. Owing to its precedence in paging, Dr. J. A. Allen¹ rightly adopts the name *arcticus* for the American Polar Hare, *glacialis* of Leach becoming a synonym.

The question has been raised by my friend, Mr. Outram Bangs, whether Ross, and not Leach, should have credit for the name *arcticus*. We may justly infer from Ross' description that he intended that Leach should have this credit and that he published it with such intention. He must have consulted with Leach about its relations to the European and Scottish Hares and quotes Leach in his diagnosis, using, without doubt, the specific name then suggested by Leach. The fact that Leach gave it another name does not affect the status of the one given by Ross, nor weaken Leach's claim to it. From the present custom, not definitely formulated in our American Ornithologist's Union's canons of nomenclature, I see, however, no alternative but to call the Baffin Land Hare, *Lepus arcticus* Ross.²

¹ Mon. N. Amer. Rod., 1877, p. 288.

² Some authorities prefer that sole credit for the name of a species be given to the person to whom the original publisher of that name ascribes the origin of the name, writing it in this case *Lepus arcticus* Leach. The A. O. U., with one (or two?) exceptions, adopts the reverse rule in their check list of birds, and would make it read *Lepus arcticus* Ross. Neither method does justice either to the public or to

Dr. J. A. Allen (l. c.) concludes that the American Polar Hare is not specifically separable from the European *L. timidus* (= *variabilis* Auct.), and the deficient material which he had for examination at that time probably justified such a verdict as the safest one, especially when we consider the standard of species and varieties adopted at that date by American mammalogists. Through the kind liberality of Messrs. G. Brown Goode and F. W. True of the Smithsonian Institution, and of Mr. Outram Bangs of Boston, I have been favored to examine, in connection with the specimens in the Academy of Natural Sciences of Philadelphia, an unusually large series of skins and skulls of the Polar Hares of America and northwestern Europe. The results of this study, so far as they relate to the Polar Hares of eastern North America, and Scandinavia may be summed thus briefly.—

1. *LEPUS TIMIDUS* L. Scandinavian Polar Hare.

Type locality (hypothetically restricted), Southern Sweden.

Nasals nearly or quite reaching to anterior vertical plane of premaxillaries. Posterior frontal swelling on a plane with the postorbital processes. Upper incisor with transverse sectional diameter greater than the longitudinal diameter; the chord of the arc of its exposed surface (with skull, minus mandibles, resting on a plane horizontal surface) is vertical; the radius of the arc described by the incisors is one-eighth ($\frac{1}{8}$) of the basilar length of skull; their inner faces indented by a deep broad sulcus and they are rooted on the premaxillaries at or slightly anterior to the inferior maxillo-premaxillary sutures. Roots of lower incisors extending to base of pm. 1.

Summer pelage; above blackish brown, sprinkled with gray; ears darker, but not black, tail white, dark above.

2. *LEPUS ARCTICUS* "Leach," Ross. Baffin Land Polar Hare.

Type locality, lat. 73° 37', northern Baffin Land, southeast of Cape Bowen.

Size larger (?) than *timidus*, with relatively smaller and wider skull and shorter ears. Skull of the same type as *timidus*, with the following differences: Nasals, rostrum and incisive foramina relatively those personally interested. I suggested (Proc. Acad. Nat. Sci., Phila., 1895, p. 395), that both the publishing and the manuscript or verbal authority for such names should be indicated. My friend, Witmer Stone, has suggested an improvement on my formula which I heartily endorse, viz., that instead of "*Rana clamitans* Bosc., Mss., Sonn., Latr." (l. c.), it should read *Rana clamitans* "Bosc.," Sonn. & Latr., and the Baffin Land Hare would read *Lepus arcticus* "Leach," Ross. This comports far better with our motto that, "Zoological nomenclature is a means, not an end, in zoological science."

shorter and broader, the incisive foramina never reaching to middle of pm. 1. Palatal bridge longer than width of postpalatal fossa. Supra orbital processes of frontals deeply notched anteriorly, upraised and widely flaring. Frontals, at their posterior constriction, remarkably tumid, their anterior plane greatly depressed.

Summer pelage (fide Ross and Leach (l. c.) and Sabine³), white, "The back and top of the head are sprinkled with blackish brown hair which is banded with white, the sides of the neck are covered with hairs of the same color, interspersed with white. The extreme tips of the ears are tipped with black."—Leach. "In some of the full-grown specimens, killed in the height of summer, the hair was a grayish brown towards the points but the mass of fur beneath still remained white, the face and front of the ears were a deeper gray."—Sabine.

In south Baffin Land, as evidenced by a specimen from Cumberland Gulf, the type form intergrades into the following subspecies:

3. *LEPUS ARCTICUS BANGSI* Rhoads, subsp. nov. Newfoundland Polar Hare. Type locality, Codry, Newfoundland. (Diagnosis as given below.)
4. *LEPUS GRÆNLANDICUS* Rhoads, sp. nov. Greenland Polar Hare. Type locality, Robinson's Bay, Greenland. (Diagnosis as given below.)

LEPUS ARCTICUS BANGSI,⁴ subsp. nov. Newfoundland Polar Hare.

Type, Ad. ♀, No. 3752; Col. of E. A. & O. Bangs. Collected by Ernest Doane at Codry, Newfoundland, Aug. 3d, 1895.

Description.—Size equal to *L. timidus* L., of Southern Sweden, with shorter ears, shorter and broader skull, nasal bones and incisive foramina, weaker dentition and narrower frontal breadth anterior to the supraorbital processes.

Adult summer pelage: entire back and upper sides, including neck, shoulders and outer surfaces of thighs, uniform dark grizzled gray, faintly suffused with tawny. A pinch of hairs from near middle of back shows the following color pattern: under-fur fine, tawny-white basally, becoming tawny at distal end; over-fur white or black at base in about equal proportions, the coarser black-based hairs black throughout, the finer white-based hairs with terminal half black, interrupted by a subterminal band of white or pale tawny. Lower head

³ Suppl. Appx., Parry's Voy., 1824, pp. 187-188.

⁴ Named for Mr. Outram Bangs, who has done so much in making known the mammal fauna of Newfoundland, and who has there collected the finest study-series of Polar hares that can be found in this country.

(including chin), lower neck, nape, forebreast to forelegs, lower sides, edges of thighs and rump, dark plumbeous gray, flecked with very long, slender, white hairs. Lower breast, belly, vent and tail white, bordered by a nearly clear plumbeous edging which separates the ventral from the abdominal regions and joins the dark rump along the inside of thighs. Inner anterior border of hams, sides of hind feet and toes, and lower surfaces of forelegs, white, thinly intermixed with leaden hairs. Outer surfaces of fore and hind legs and superior surfaces of the feet, tawny gray. Ears and space between them, black, becoming grayish at base and with a narrow whitish outer posterior margin from near base to tip. Upper head, including cheeks and nose, grizzled buffy gray, appreciably lighter than the gray shades of the back. Eyelids whitish, edged with black. Whiskers weak and sparse, white and black in equal proportions, the longer black hairs tipped with white.

Winter pelage (No. 1187, Ad. ♀, Col. of E. A. & O. Bangs. Bay St. George, Newfoundland, Mar. 1, 1895): Entire pelage, exclusive of ears, white. Extreme tips of ears black, the median anterior borders of ears grayish.

Measurements (of type).—Total length, 626 millimeters; tail vertebrae, 63; hind foot, 160; ear (from crown), 85. Skull: total length, 97; basilar length, 76; greatest breadth, 48.2; anterior frontal constriction, 23; length of nasal (longest diagonal), 40; greatest breadth of nasals, 22; alveolar breadth of upper incisors, 9; greatest length of mandible, 76; greatest width of mandible, 47.

The above measurements both of body and skull are a very fair average of the dimensions of five adults taken for Mr. Bangs in Newfoundland by the same collector, Mr. Ernest Doane. Summer specimens from northern Labrador are inseparable from those taken in the same month in Newfoundland. A summer series from Great Slave Lake may show the existence of another race of *arcticus* in that region.

LEPUS GRŒNLÄNDICUS sp. nov. Greenland Polar Hare.

Type, No. 1486 ad. ♂. Col. of Acad. Nat. Sciences, Philadelphia. Collected by Chas. E. Hite at Robinson's Bay, North Greenland, Aug. 2, 1892, for the Peary Relief Expedition.

Description.—Size larger than *L. timidus* L. of Sweden, with radically distinct coloration and incisor dentition.

Adult summer pelage, white, suffused with light tawny and sparingly sprinkled with gray on upper head and ears. Back with scattering black and gray hairs. Tip of ears black. Tail, sides and lower sur-

faces pure white. Half grown young in July and August like adult, but darker, owing to greater abundance of colored hairs and the leaden under fur. Appearances of young and old at a distance at all seasons, white.

Winter pelage, pure white throughout, except the tips of ears, which are black.

Skull with rostral portion anterior to pm. 1, relatively much longer and more attenuate, owing to the outward prolongation of the premaxillaries and the small calibre of incisors. Upper and lower incisors very long, produced and slender, their transverse diameter being less than the longitudinal. Upper incisors describe the arc of a circle whose radius is one-fifth ($\frac{20}{100}$) the basilar length of the skull. The chord of their exposed arcs (with cranium, minus mandibles, resting on a plane horizontal surface) forms an angle of 45° to the horizontal plane. Face of upper incisors multistriate, the normal sulcus peculiar to all other members of the genus being so filled with dentine in adult *grœnlandicus* as to obliterate the depression, presenting an even, rounded, enameled contour marked with three minute striæ.

Roots of upper incisors based on the maxillaries and reaching back nearly half way from inferior maxillo-premaxillary sutures to pm. 1. Roots of lower incisors extending to the base of pm. 2.

Measurements (of type taken from dry mounted skin, relaxed): ear, from crown, 100 millimeters; hind foot, 145; tail vertebræ (dry), 50?

Skull: total length, 100; basilar length, 84.5; greatest breadth, 50; anterior frontal constriction, 22.5; length of nasals (longest diagonal), 41; greatest breadth of nasals, 20.5; alveolar breadth of upper incisors, 8.5; greatest length of mandible, 76; greatest width of mandible, 48.

Five skins, seven skulls, and one skeleton, all from North Greenland, comprise the Academy series of Greenland Hares, and all confirm the peculiar characters of this species as above given. I regret that more complete body measurements are not available. Average adult measurements of ear and hind foot are 100 millimeters for the former and 145 for the latter. The total length of an adult skeleton (ligamentous) is 519 millimeters, measured as in the flesh, from tip of nose to end of tail vertebræ.

It is possible that Spitzbergen and Iceland Hares are of the same type as those of Greenland. None of these have come into my hands. The Bavarian, Swiss, Scottish, Irish and Siberian representatives of *timidus* are also likely to prove separable, at least into definable races, already named. From what is known of Linnæus at the time of writ-

ing his tenth edition of the System, it is most fitting that the Polar Hare of Southern Scandinavia should be made the type of the *timidus* group, the Swedish Hares being those which would most naturally embody and form the source of his original diagnosis.

The writer is now preparing a more compendious revision, with illustrations, of the New World representatives of the *Lepus timidus* group, which will probably appear in a future number of the Proceedings of the Academy of Natural Sciences of Philadelphia.

—SAMUEL N. RHOADS.

ENTOMOLOGY.¹

On Certain Geophilidæ Described by Meinert.—The Chilopoda of the Museum of Comparative Zoology were studied by Dr. Meinert, and the results published in a paper entitled "*Myriapoda Musei Cantabrigiensis*."² Many new species were described, but as no figures were given, identification is not in all cases easy, although the descriptions are of considerable length. With reference to the Geophilidæ, at least, there are certain misleading statements and unfortunate omissions. During a recent visit to Cambridge I had the pleasure of a very brief examination of the types of several of Dr. Meinert's species, and some long-standing curiosity was satisfied.

Geophilus georgianus Meinert.

According to Dr. Meinert this species has but a single pleural pore. For some years past I have had specimens from the South which agreed well with the description of this species, but had two pores. As this character is a very constant one, my determination was not made with confidence. The type of *georgianus* has, however, two large pores on each side concealed under the last ventral plate, so that the anomaly is disposed of. The pores are similar in structure and location to those of *G. rubens*.

Geophilus cephalicus Wood.

The specimens described by Meinert, and previously by Wood as *cephalicus* belong to *G. rubens* Say. I have examined the type in the British Museum. It is the most common geophilid in the northeastern states.

Geophilus urbicus Meinert.

No ventral pores could be made out. The sterna are uneven and the whole animal is very hairy. The form of the body, the armature

¹ Edited by Clarence M. Weed, New Hampshire College, Durham, N. H.

² Proc. Am. Phil. Soc. XXI, pp. 161-233 (1885).